

REMARKS

Status of the Application

Claims 1-26 are pending in the application. Claims 1-20 and 23-26 are rejected under 35 U.S.C. § 102(b) as being unpatentable over Tomoko Matsubara (Development of high-speed processing algorithm for mass detection based on thresholding technique in mammograms). Claim 21 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Tomoko Matsubara (Development of high-speed processing algorithm for mass detection based on thresholding technique in mammograms) in view of Yoshida (U.S. 2003/0021478). Claim 22 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Tomoko Matsubara (Development of high-speed processing algorithm for mass detection based on thresholding technique in mammograms) in view of Takeo et al. (U.S. 2003/0039385).

By this Amendment, Applicants are adding new claim 27.

Preliminary Matters

Applicants thank the Examiner for withdrawing the objections to the specification and the claims.

Claim Rejections - 35 U.S.C. § 102

Claims 1-20 and 23-26 are rejected under 35 U.S.C. § 102(b) as being unpatentable over Tomoko Matsubara (Development of high-speed processing algorithm for mass detection based on thresholding technique in mammograms).

Applicants note that the Examiner has provided the same substantive rejection of claim 1 as was provided in the Office Action dated March 6, 2007. Therefore, the following comments are directed toward the Examiner's Response to Argument found on pages 2-4 of the instant Office Action.

Applicants submit that the Examiner has still erroneously compared the present invention with the cited reference. According to the Examiner's comparison, there is a discrepancy between the processing sequence recited in claim 1 and that described in Matsubara et al.

Matsubara et al. discloses a process comprising:

Step b1: extracting a breast region from each original image,

Step b2: classifying the breast regions in each of the original images into three categories based on the histograms of the pixel values of the images, and dividing the breast regions which belong to a "mixed" category into a mammary gland region and a fat region,

Step b3: determining one threshold value for each of the classified or divided regions,

Step b4: performing binary processing on each of the classified or divided regions in each of the original image using each of the determined threshold value(s) to obtain a binary image,

Step b5: performing labeling processing on the binary image to detect low-density regions in the classified or divided region as tumor candidates, and

Step b6: calculating various feature values of each of the candidates, and determining tumor shadow(s) by eliminating false-positive candidate(s) based on the calculated feature values.

The Examiner contends that step b2 in Matsubara et al. corresponds to the process performed by the threshold value control means recited in claim 1 (please refer to page 2, line 15

- page 3, line 8 and page 5 lines 1-5 in the present Office Action). Meanwhile, the Examiner contends that step bl in Matsubara et al. corresponds to the process performed by a primary-label region extracting means recited in claim 1 (please refer to page 4, lines 2-5 and page 5, lines 4-8 in the present Office Action), and, thus, a reversal of the processing sequence occurs from that noted in the system recited in claim 1. However, as recited in claim 1, each of the elements of the system must perform their functions in a particular order. Thus, a reversal of the processing sequence cannot anticipate claim 1.

Moreover, claim 1 recites, in part, “a primary-label region extracting means which attaches a primary label to an isolated region in each of the binary images and extracts the isolated regions attached with the primary label as primary-label regions” and “a growth score calculating means which calculates for each primary-label region a growth score for evaluating the likelihood that the primary-label region represents a growth.” The Examiner alleges that Matsubara discloses all of the aspects of claim 1. In particular, the Examiner further alleges that page 4, lines 5-17 and page 6, lines 10-15, along with page 5, lines 3-15 discloses the former noted aspect of claim 1. Further, the Examiner alleges that page 8, paragraph 3 to page 9, lines 1-6 discloses the latter noted aspect of claim 1. Applicants respectfully disagree.

Page 4, lines 5-17 of Matsubara discloses constructing an algorithm for detecting mass shadows using a threshold value method wherein 1) images are classified into three categories according to amounts of mammary glands, 2) low density regions (mass shadow candidates) are detected using threshold values, and 3) false-positive candidates are excluded. Page 6, lines 10-15 of Matsubara discloses that each of the three categories of the amounts of mammary glands show large pixel amounts for different specific pixel values. Page 5, lines 3-15 discloses that

only the breast regions necessary for analysis are extracted from the density distributions of the image. The Examiner then indicates that, based on the above, Matsubara discloses the recited primary region extraction on binary images. However, page 5, lines 3-6 indicates that the density distributions are based on *original images*. Claim 1, on the other hand, recites that the primary-label region extracting means attaches a primary label ...in each of the binary images and extracts the isolated regions attached with the primary label. Thus, the attaching and extracting are not performed on original images, as disclosed by Matsubara.

Additionally, in claim 1, the threshold values are determined to create binary-coded images. Meanwhile, in Matsubara et al., the pixel values to which the Examiner refers are determined to classify each of the original images. The Examiner seems to have misinterpreted the word "classify" in Matsubara et al. Specifically, the Examiner has argued, at page 3, lines 2-8 in the present Office Action, that Matsubara et al, discloses three threshold values for the three categories of images created. However, Matsubara et al. does not create any new images from the original images but just classifies the original images into three categories by using these three threshold values.

Further, even assuming, *arguendo*, that Matsubara discloses the recited primary-label extracting means, Matsubara fails to disclose the growth score calculation means recited in claim 1. Page 8, paragraph 3 (lines 21-26) through page 9, line 6 of Matsubara discloses that an entire extracted breast region is searched for low density regions. However, during the search, which segments the breast region into thick glandular regions and fatty regions (see page 9, lines 7-11), there is no indication that a growth score is calculated for each primary-label region. Rather, the portion of the reference cited by the Examiner simply indicates that low density regions are

determined by searching the entire extracted breast region. Thus, Matsubara fails to state that a growth score for evaluating the likelihood that the low density regions represents a growth is determined.

For the reasons indicated above, Matsubara fails to disclose all of the elements of claim 1, and claim 1 is patentable over the applied article. Claims 2-20 and 23-26 is patentable over the applied article, at least by virtue of their dependency from claim 1.

Claim 2 is patentable for reasons independent of its dependency from claim 1. Specifically, claim 2 recites a secondary-label determining means that “(i) judges whether the respective isolated regions have been extracted twice or more as the primary-label regions.” The Examiner alleges that page 13, paragraph “(3) Reanalysis” of Matsubara discloses this aspect of the instant invention. However, the “reanalysis” performed by Matsubara simply looks at a single image, determines the area of the image which has a high standard deviation, and reclassifies the standard deviation and circularity to reevaluate the candidates that fall within the are having a high standard deviation. However, as noted, Matsubara makes this determination based off of a single image. Claim 2, on the other hand, recites judging whether isolated regions determined to be primary-label regions in *two or more binary images*. See new claim 27. Matsubara fails to disclose that the area chosen for reanalysis is determined based on respective regions being *extracted twice or more* as primary-label regions. Thus, Matsubara fails to disclose all of the elements of claim 2, and claim 2 is patentable over the applied art.

Claim Rejections - 35 U.S.C. § 103

Claim 21 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Tomoko Matsubara (Development of high-speed processing algorithm for mass detection based on thresholding technique in mammograms) in view of Yoshida (U.S. 2003/0021478).

Claim 21 is dependent from claim 1. Because Matsubara fails to disclose all of the aspects of claim 1, claim 21 is patentable at least by virtue of its dependency.

Further, Yoshida discloses, in the Examiner's cited portion, an image process which forms a brightness histogram of an input image in such a way that the brightness is distributed from the maximum value to the minimum value. This image process fails to correlate to the stepwise control of the threshold values for binary-coding from a maximum brightness value to a minimum value as recited Claim 21.

Claim 22 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Tomoko Matsubara (Development of high-speed processing algorithm for mass detection based on thresholding technique in mammograms) in view of Takeo et al. (U.S. 2003/0039385).

Claim 22 is dependent from claim 1. Because Matsubara fails to disclose all of the aspects of claim 1, claim 21 is patentable at least by virtue of its dependency.

With further regard to claim 22, the Examiner concedes that Matsubara fails to teach threshold determination independent of the image data and cites Takeo to make up for the deficiency. However, Matsubara relies on image density information to set the thresholds, thereby teaching away from its combination with Takeo. Moreover, Takeo and Matsubara rely on fundamentally different characteristics for evaluation. Takeo relates to structure sizes and

Matsubara relies on density. The density determinations of Matsubara must be as a relative basis and thus must be determined based on the image data. In contrast, the structure size determination of Takeo can appropriately take on empirical information. The analyses of each reference are not compatible, and thus the Examiner's reliance on "uniqueness" of threshold as applied to Matsubara is fundamentally incorrect.

New Claims

Applicant hereby adds new claim 27. Claim 27 ultimately depends from claim 1, and is patentable at least by virtue of its dependency therefrom.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

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The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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